Racial Disparities in the Regionalization of Care for Patients with ST-Segment Elevation Myocardial Infarction (STEMI)

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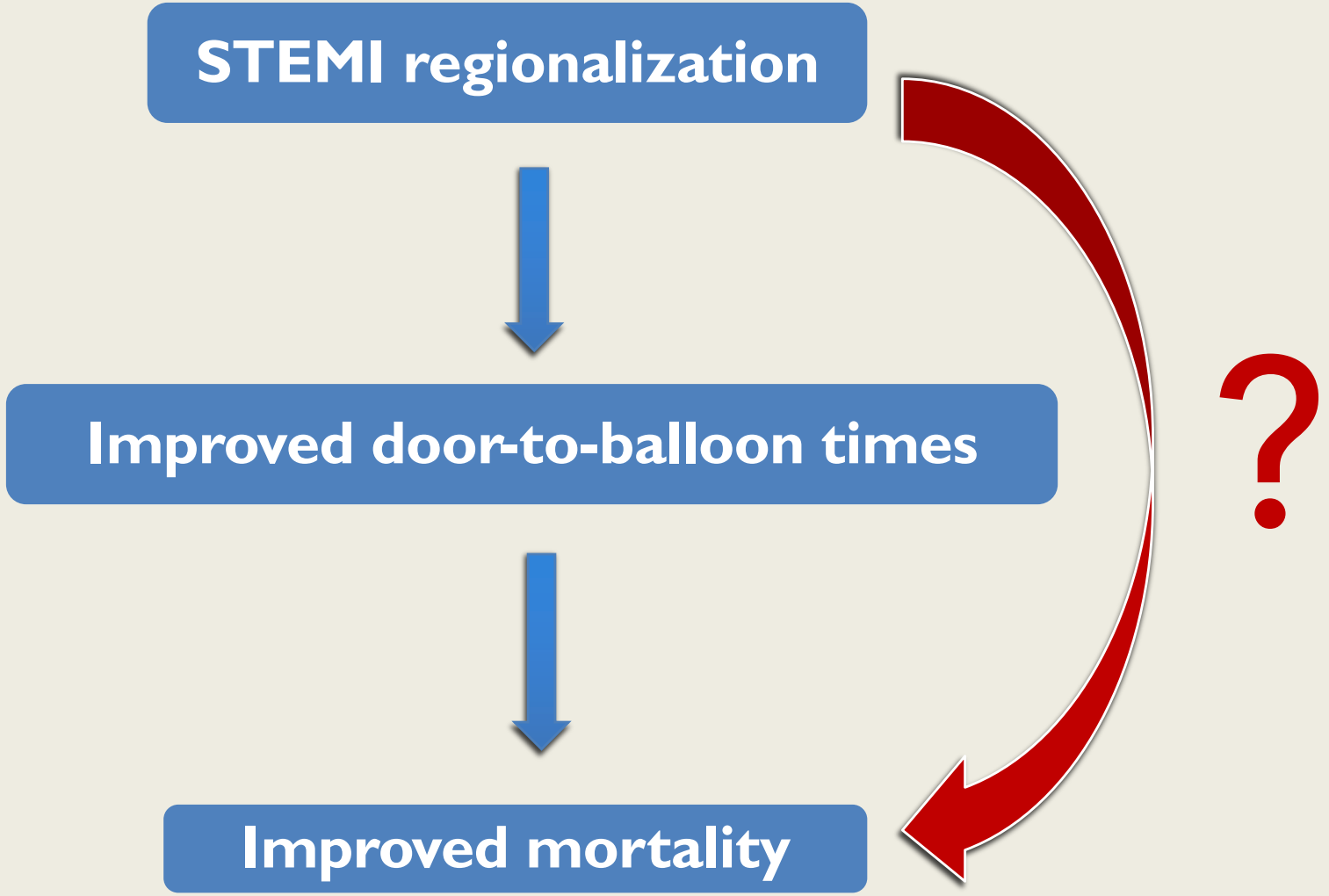
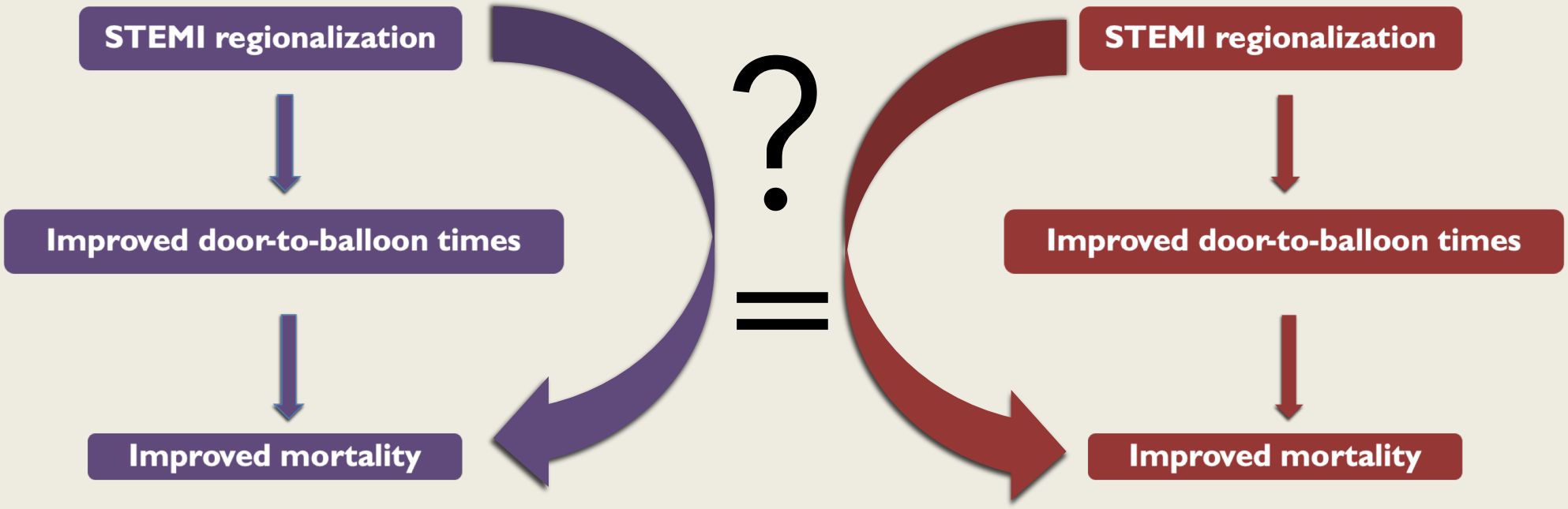
Presentation Overview

- Background and objectives
- Data
- Methods
- Results
- Discussion

Background on CA STEMI Regionalization



Background on CA STEMI Regionalization



Non-minority community

Minority community

Research Objectives

1. Has STEMI regionalization policy widened or narrowed disparities in access, treatment, and outcomes for patients with STEMI between *minority and non-minority communities* when both are exposed to regionalization?

2. Are White and minority patients from the same type of community have similar experience when both are exposed to STEMI regionalization policy?

Data Sources

- California STEMI policy protocol database
  - Effective starting date
  - Protocol details (pre-hospital, inter-hospital)
- California non-public patient discharge data
  - Both inpatient and emergency department
- Vital statistics
- California's Office of Statewide Health Planning and Development (OSHPD) facility utilization data
  - Annual total volume of selected procedures

Patient Cohort

- Patients with STEMI: principal diagnosis is 410.x0, 410.x1 but exclude 410.7x (nSTEMI)
- Between Jan 2006 to September 2015
  - Mortality data ends in Dec 2013
- All patients regardless of insurance/payer type

Empirical definition of regionalization

- Based on class I recommendations from the American College of Cardiology and American Heart Association. A county is regionalized on and after the year that at least 50% of its EMS jurisdiction met either of the following:
  1. EMS that direct pre-hospital transport to bypass the nearest hospitals that do not offer emergent PCI to facilities that offer emergent PCI for patients with STEMI; and
  2. have inter-hospital transfer protocols specifically for patients with STEMI
- Sensitivity analysis further categorized regionalization status to finer categories

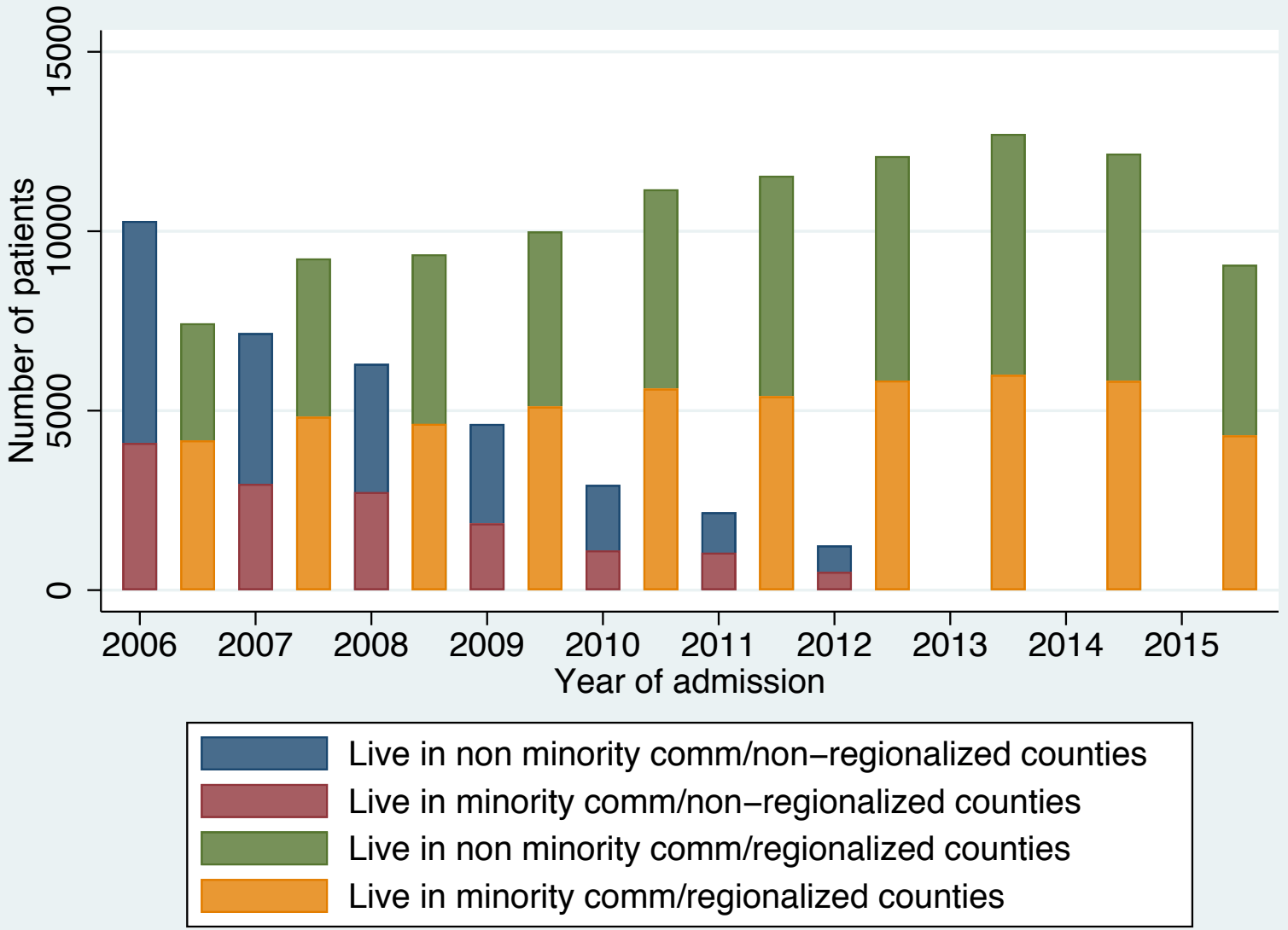
Definition of minority status

- Community level
  - defined at ZIP code level
  - considered minority if its share of the Black or Hispanic population is at the top tertile of the overall California distribution, based on 2000 Census data
- Individual level
  - based on race/ethnicity group on the patient discharge data
    - White, Black, Hispanic, Asian, others

Outcomes

- **Access**
  - Whether a patient was admitted to a PCI capable hospital
- **Treatment**
  - Whether a patient received PCI on the day of admission
  - Whether a patient received PCI during the care episode
- **Health outcomes**
  - 30-day, 90-day, and 1-year mortality
  - 30-day readmission

Proportion of patients by community minority status and county regionalization status 2006–2015



Model 1: Linear probability model with county fixed effects

$$Y_{ijkt} = \alpha_t + \beta_1 MC_k + \beta_2 D_{jt} + \beta_3 D_{jt} \times MC_k + \beta_4 X_{ijkt} + Z_j + \epsilon_{ijkt}$$

Y_{ijkt} = Outcome of patient i residing in county j community k who had STEMI in year t

α_t = time trend

MC_k = 1 if community k is a minority community

D_{jt} = 1 on and after county j is exposed to regionalization policy

$D_{jt} \times MC_k$ = interaction term between exposure to regionalization policy and minority community status.

X_{ijkt} = individual race/ethnicity groups, other demographics, insurance, comorbid conditions

Z_j = county fixed effects

Model 1 Results on Admission and Treatment Outcomes

	Admitted to PCI hospital	Received PCI on the same day	Received PCI during the episode
Sample mean at baseline (%)	72.7%	49.7%	64.2%
Changes in outcome after non-minority county is regionalized	6.3**	5.1**	5.0**
95% CI	[5.5,7.1]	[4.2,6.1]	[4.2,5.9]
Additional change in outcome in minority communities relative to non-minority	-1.8**	-3.4**	-4.3**
95% CI	[-2.8,-0.8]	[-4.5,-2.2]	[-5.3,-3.2]
N	135579	139257	139257

Model 1 Results on Health Outcomes

	30-day mortality	90-day mortality	1-year mortality
Sample mean at baseline (%)	13.6%	16.6%	21.4%
Changes in outcome after non-minority county is regionalized	-0.5	-0.6	-0.6
95% CI	[-1.3,0.2]	[-1.3,0.2]	[-1.4,0.2]
Additional change in outcome in minority communities relative to non-minority	0.2	0.4	0.7
95% CI	[-0.6,1.0]	[-0.5,1.3]	[-0.2,1.6]
N			117896

Model 2: Differentiated by Individual and Community Minority Status

$$Y_{ijkt} = \alpha_t + \beta_1 MC_k + \beta_2 WN_{ijkt} + \beta_3 MN_{ijkt} + \beta_4 WM_{ijkt} + \beta_5 MM_{ijkt} + \beta_6 X_{ijkt} + Z_j + \epsilon_{ijkt}$$

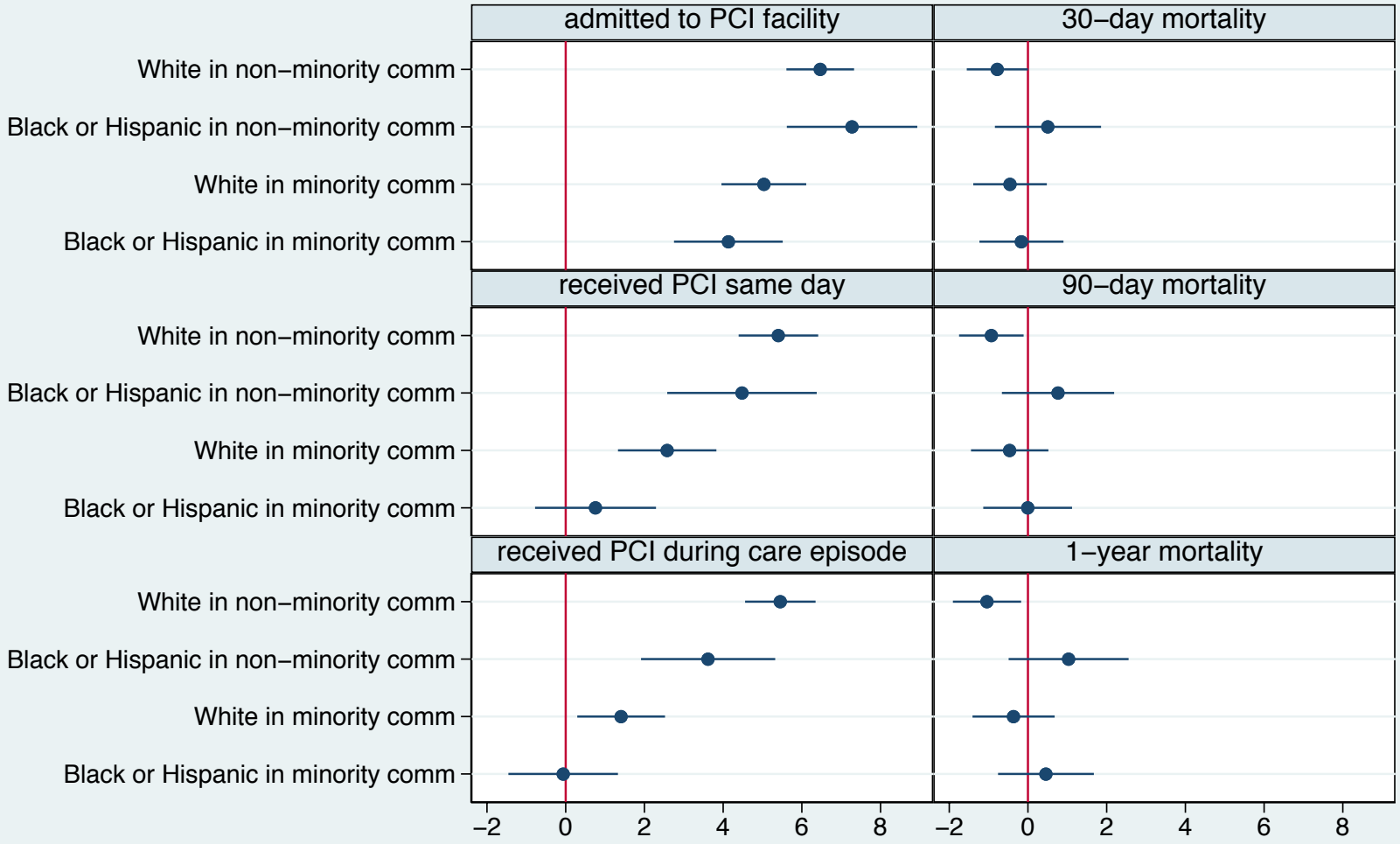
$WN_{ijkt} = 1$ on and after a White patient i in non-minority community k from county j is exposed to regionalization policy

$MN_{ijkt} = 1$ if Black or Hispanic patient in non-minority community

$WM_{ijkt} = 1$ if White patient in minority community

$MN_{ijkt} = 1$ if Black or Hispanic patient in minority community

Regression-adjusted Percentage Point Changes in Outcomes After Exposure to Regionalization



Additional analysis

- Limiting observations to counties with similar pre-regionalization mortality trend
- Finer gradient of regionalization scope:
  - Partial: 50%-94% of jurisdiction met one of the criteria but not both
  - Substantial: 50%-94% of jurisdiction met both criteria
  - Complete: at least 95% met both criteria
- Excluding patients with STEMI whose principal diagnostic code is 410.9x

Discussion

- Patients of any race/ethnicity in minority communities with STEMI derived smaller benefits from cardiac care regionalization than those in non-minority communities.
- White patients in non-minority communities experienced a mortality improvement when exposed to regionalization, but other groups had little or no improvement when exposed to regionalization.
- Potential mechanisms
  - Pre-hospital factors
  - Practice pattern and resource differences across hospitals serving non-minority and minority communities

Other related works

- Are there spillover effects of STEMI regionalization on NSTEMI patients?
- Is racial disparity also present in other technology expansions?
  - Case of stroke certification programs